PAIWA STREET EXTENSION - PRELIMINARY SOIL REPORT

WAIPAHU, OAHU, HAWAII
TAX MAP KEY: 9-4-02: POR. 3 & 4

To:
COMMUNITY PLANNING, INCORPORATED

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

APRIL 13, 1972

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

WALTER LUM
EDWARD WATANABE
EZRA KOIKE
WALLACE WAKAHIRO
3030 WAIALAE AVE., HONOLULU, HAWAII 96816 • TEL. 737-7931

April 13, 1972

MR. GEORGE HOUGHTAILING
Community Planning, Inc.
700 Bishop Street, Suite 608
Honolulu, Hawaii 96813

Dear Mr. Houghtailing:

Subject: Paiwa Street Extension
Preliminary Soil Report
(for pavement design purposes)
Waipahu, Oahu, Hawaii
Tax Map Key: 9-4-02: Por. 3 & 4

Transmitted herewith is our soil exploration report for pavement design purposes for the proposed Paiwa Street Extension at Waipahu, Oahu, Hawaii.

The report includes a Boring Location Plan, boring logs, laboratory test results, recommendations and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Ezra Koike

Ezra Koike
Professional Engineer
Hawaii No. 1450

EK:rmf

C O N T E N T S

PAIWA STREET EXTENSION - PRELIMINARY SOIL EXPLORATION

WAIPAHU, OAHU, HAWAII
TAX MAP KEY: 9-4-02: POR. 3 & 4

SCOPE OF EXPLORATION

The purpose of this exploration was to determine general soil conditions for the proposed Paiwa Street Extension in Waipahu.

This report includes field explorations, laboratory tests and general pavement design recommendations.

FIELD EXPLORATION

Four exploratory borings and one sounding were made at the site. The approximate locations of these borings and sounding are shown on the Boring Location Plan. Descriptions of the underlying soils encountered are shown on Boring Logs Nos. 1 thru 5. Also attached are logs of borings previously made for Waipahu Estates Unit 3-2, Proposed Haul Cane Road in Waipahu and Proposed Overpass Structure Over Haul Cane Road in Waipahu.

Borings were made with 4-in. diameter augers using a carbide drag bit. Soil samples were obtained with 2 and 3-in. thin-wall tube samplers and a 2-in. standard split spoon sampler driven with a 140-lb hammer falling 30 inches.

LABORATORY TESTS

Laboratory tests included: natural water content, Atterberg limit, unconfined compression, grain-size analysis, expansion and CBR. A summary of the laboratory test results is given in Tables IA and IB.

SOIL CLASSIFICATION SYSTEM

Soil samples were visually observed and subjected to appropriate tests in the laboratory. Based on visual observations and laboratory tests, the soil descriptions given on the boring logs are generally made in accordance with the "Unified Soil Classification System."

GENERAL SITE CONDITIONS

The northern section of the proposed road alignment is partly along an existing sugar cane field and cane haul road. The central portion crosses an old gully or drainageway, and the southern section crosses an area occupied by existing plantation homes.

The natural drainageway slopes downward in a southeasterly direction at about a 2% gradient with side slopes varying from about 8 to 15%.

An existing silting basin was noted about 50 ft east of the proposed roadway near the central section of the new road alignment.

INTERPRETATION OF SOIL CONDITIONS

From the field exploration and laboratory test results, the soils may be generally described as follows:

Stiff clayey silts and silty clays ("MH" soils) to about 15 ft, the depth drilled.

Rocky material was encountered in the borings in the northern and central sections.

Clay pockets ("CH" soils) were encountered in Boring No. 4 from about 3 to 12-ft depths.

Water was not noted in the borings during the field exploration.

For more detailed descriptions of soils encountered in the borings, refer to the boring logs.

DISCUSSION AND RECOMMENDATIONS

The proposed plan is to construct a new road (2,900± ft) from the south side of the Interstate H-1 freeway extending in a southerly direction to Waipahu Street.

Preliminary plans indicate cuts of about 5 to 10 ft in the northern section, fills of about 2 to 12 ft in the central section, and shallow cuts and fills in the southern section.

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PROPOSED HAUL CANE ROAD IN WAIPAHU
LOCATION: From Interstate H-1 to Aualii St.
Waikele, Ewa, Oahu, Hawaii

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 2 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date OCT. 15 & 16, 1971
Field Party MAKAULA, ASATO, COLLURA, GLORY
Type of Boring AUGER (MOBILE B-40) Diam. 6" (HOLLOW STEM)
Elev. 118'± * Datum —
Drill Bit T.C. DRAG

Water Level					
Time	—				
Date	10-16-71				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 118'± *	0								
ML				2-A	28	31	44	-	-	
MH	STIFF, REDDISH BROWN CLAYEY SILT	5		2-B	16	32	52	-	-	
		10		2-C	-	35	-	-	-	
	MOTTLED GRAY BROWN DECOMPOSED ROCK	15		2-D	-	34	-	-	-	
	GRAY, BOULDER OR ROCK	20		2-E	-	-	-	-	-	31/.1'
	GRAY, DECOMPOSED ROCK	25		2-F	-	36	-	-	-	30/.3'
	BOULDER OR ROCK FORMATION	30		2-G	-	6	-	-	-	30/.1'
		35		2-H	-	NO	RECOVERY	-	-	20/.0'
	BROWNISH GRAY DECOMPOSED ROCK (PUKA PUKA)	40		2-I	-	17	-	-	-	10/.1'
	END OF BORING @ 40.6'									

*ELEVATION ESTIMATED FROM PROFILE DATED AUG. 10, 1971

HARD DRILLING

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PROPOSED HAUL CANE ROAD IN WAIPAHU
LOCATION: From Interstate H-1 to Aualii St.
Waikele, Ewa, Oahu, Hawaii

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" SS - 2" O.D. THIN WALL TUBE
2" SS - 2" STANDARD SPLIT SPOON

BORING NO. 4 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date OCT. 15, 1971
Field Party SUZUKI, RADOVICH, MAESHIRO, KAKU
Type of Boring AUGER (ACKER & ACE B-30) Diam. 3"
Elev. 82' ± * Datum —
Drill Bit T.C. DRAG

Water Level					
Time	—				
Date	10-16-71				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER, BLOWS/0.5'
	ELEV. = 82' ± *	0									
(MH)	STIFF, REDDISH BROWN CLAYEY SILT		2"SS	4-A	-	21	-	-	-		
(MH)	MEDIUM, REDDISH BROWN CLAYEY SILT	5	2"SS	4-B	-	-	-	-	-		75/.5'
	ROCK OR BOULDER										
	MEDIUM, REDDISH BROWN CLAYEY SILT	10	2"S	4-C	-	21	-	-	-		8/.5' 14/.5'
	STIFF, LIGHT BROWN CLAYEY SILT					(UNABLE TO EJECT SAMPLE)					
(MH)	STIFF, MOTTLED REDDISH BROWN, SILTY CLAY	15	2"SS	4-D	-	23	-	-	-		26/.5'
ML	STIFF, BROWN CLAYEY SILT & TRACES OF DECOMPOSED ROCK	20	2"SS	4-E	32	30	42	-	-		28/.5'
	STIFF REDDISH BROWN & BROWN CLAYEY SILT & DECOMPOSED ROCK	25	2"SS	4-F	-	38	-	-	-		40/.5'
	BOULDER	30	2"SS	4-G	-	-	-	-	-		50/.0' HAMMER BOUNCES

* ELEVATION ESTIMATED FROM PROFILE DATED AUG. 10, 1971

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD IN WAIPAHU

LOCATION: Waikele, Ewa, Oahu, Hawaii

HAMMER: Weight 140# Drop 30"

SAMPLER: 2" S. 2" O.D. THIN WALL TUBE; 2" SS - 2" STANDARD SPLIT SPOON

BORING NO. 1 Sheet No. ____ of ____

Driller W. LUM ASSOC. INC. Date DEC. 18, 1971

Field Party GLORY, KAIKU

Type of Boring AUGER (MOBILE B-30) Diam. 4"

Elev. 114'± * Datum —

Drill Bit T.C. DRAG

Water Level	NOT NOTICED				
Time	—				
Date	12-18-71				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 114'± *	0									
	1" A.C.										
	BROWN, SILTY CLAY W/SAND & CORAL FRAGMENTS		2"SS	1-A	—	24	—	—	—		
(ML)	STIFF REDDISH BROWN CLAYEY SILT										
(ML)	STIFF, BROWN CLAYEY SILT	5	2"S	1-B	—	29	—	12050	—		10/.5' 10/.2'
	BOULDER										
	DRILL RATE: 7'-9.5' - 1 HR.	10									
(MH)	STIFF, REDDISH BROWN & GRAY CLAYEY SILT		2"SS	1-C	—	31	—	—	—		
		15	2"S	1-D	—	35	—	4130	—		14/.5'
(MH)	STIFF, MOTTLED BROWN CLAYEY SILT										
		20	2"SS	1-E	—	27	—	—	—		50/.4' HAMMER BOUNCES
	BROWN & GRAY DECOMPOSED ROCK										
		25	2"SS	1-F		NO RECOVERY					50/.0' HAMMER BOUNCES
	DRILL RATE: 25'-28' — 2 MIN. 28'-30' — 3 MIN.										
		30	2"SS	1-G		NO RECOVERY					50/.1' HAMMER BOUNCES
	DRILL RATE: 30'-35' — 1 HR. 40 MIN.										
		35	2"SS	1-H	—	22	—	—	—		21/.5' 50/.3' HAMMER BOUNCES
	ORANGE & BROWN SILTY SAND (DEC. ROCK)										
		40	2"SS	1-I	—	36 44 25	—	—	—		30/.5' 30/.3' HAMMER BOUNCES
	MOTTLED BROWN DECOMPOSED ROCK										
	END OF BORING @ 41.3'										

* ELEVATION ESTIMATED FROM PLAN & PROFILE DATED NOVEMBER, 1971.

WAIPAHU BRIDGE

WALTER LUM ASSOCIATES, INC.

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD IN WAIPAHU

LOCATION: Waikele, Ewa, Oahu, Hawaii

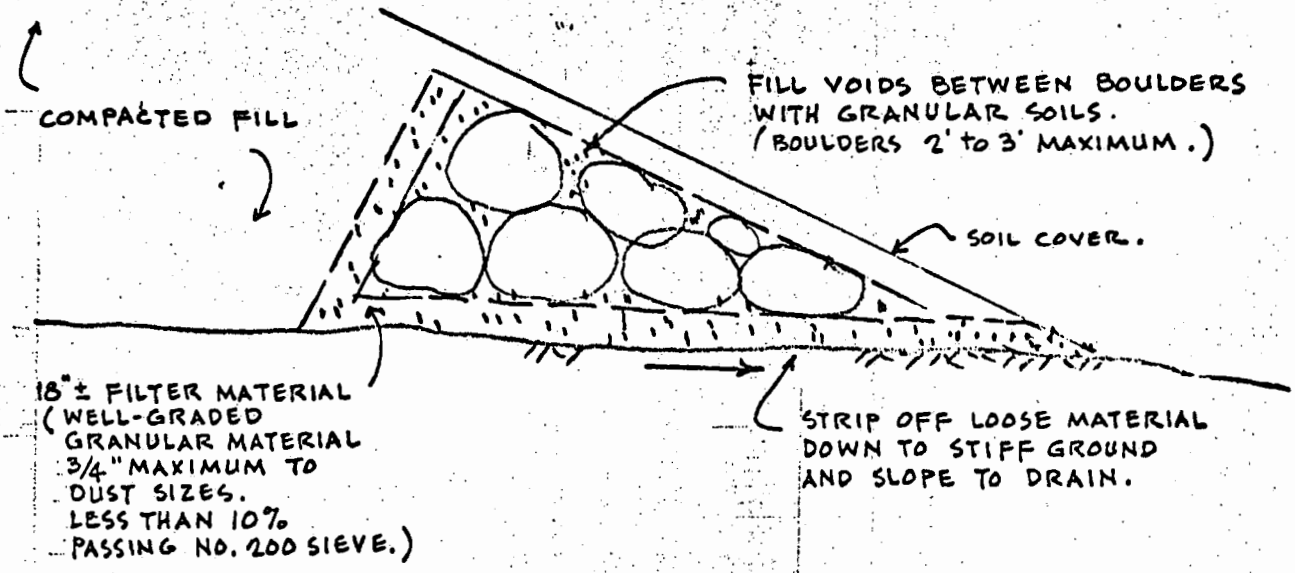
HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" SS 2" O.D. THIN WALL TUBE 2" SS 2" STANDARD SPLIT SPOON

BORING NO. 2 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date DEC. 17, 1971
Field Party GLORY, KAKU
Type of Boring AUGER (MOBILE B-30) Diam. 4"
Elev. 114'± * Datum —
Drill Bit T.C. DRAG

Water Level	NOT NOTICED			
Time	—			
Date	12-17-71			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 114'± *2	0									
(MH)	1" A.C. BROWN, SILTY CLAY W/SAND & CORAL FRAGMENTS		2"SS	2-A	-	24	-	-	-		
(MH)	STIFF, REDDISH BROWN SILTY CLAY W/TRACES OF ASH	5	2"S	2-B	-	27	-	7920	-		3/5' 6/5'
(MH)	MEDIUM, REDDISH BROWN CLAYEY SILT	10	2.5S	2-C	-	30	-	-	-		
(MH)	STIFF BROWN CLAYEY SILT	15	2"S	2-D	-	28	-	5300	-		7/5' 7/5'
(MH)	MEDIUM, REDDISH BROWN W/TRACES OF BROWN SILTY CLAY										
	COBBLE OR BOULDER	20	2"SS	2-E	-	36	-	-	-		20/5' 50/4" HAMMER BOUNCES
	MOTTLED GRAY DECOMPOSED ROCK	25	2"SS	2-F	-	32	-	-	-		50/5'
	END OF BORING @ 30.5'	30	2"SS	2-G	-	19	-	-	-		50/5'

* ELEVATION ESTIMATED FROM PLAN & PROFILE DATED NOVEMBER, 1971



SECTION

NOT TO SCALE

FIGURE 1
PROPOSED BOULDER FILL
PAIWA STREET EXTENSION

WAIPAHU, OAHU, HAWAII

TAX MAP KEY: 9-4-02 : 3 & 4

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The boring logs indicate the approximate subsurface soil conditions encountered only at the drill holes where the borings were made at the times designated on the logs and may not represent conditions at other locations or at other dates. Soil conditions and water levels may change with the passage of time and construction methods or improvements at the site.

During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes, plan changes, or construction operations at or adjacent to the site, it is recommended that this report be reviewed to determine the applicability of the recommendations considering the time lapse and the changed conditions.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted engineering practices. This warranty is in lieu of all other warranties expressed or implied.

Decomposed rocks were encountered in some borings. Because of the shallow depths to decomposed rocks, boulders will probably be found interspersed over the site. The closer an excavation approaches decomposed rocks, the greater will be the quantity of boulders. Boulders may be used to construct the toes of fill slopes, see Figure 1.

Before fills are constructed across the drainageway, loose surface soils should be stripped. Trenches should be cut in a herringbone pattern and subdrains placed in the trenches to provide drainage paths for the bottom of the drainageway.

Cesspools may be encountered near the existing plantation homes. They should be located on the Grading Plan prior to grading operations, if practicable. Sludge should be removed and the cesspool backfilled with granular material.

Site Grading

Surface vegetation, ditch linings and miscellaneous debris should be cleared and removed prior to site filling. Localized soft pockets encountered during the site preparations should be excavated and backfilled with compacted select material. Provisions to drain the site should be included during and after the completion of filling operations.

In general, the on-site soils and approved borrow soils may be used for the construction of the proposed fills. Grading work should be done according to the Revised Ordinances of Honolulu, 1961 As Amended; and as recommended below:

1. The area should be cleared and grubbed.

2. Topsoil and stockpiled soils should be either (a) stripped to stiff natural ground or (b) scarified and recompacted before the placement of fills.

3. The bottom and sides of irrigation ditches should be stripped down to stiff natural ground or scarified and recompacted before the placement of fills.

4. Thin sidehill fills (sliver fills) on sloping areas should be avoided.

5. Where fills are proposed in sidehill areas, gullies and along drainage and irrigation ditches, loose material along the bottom and sides should be stripped down to stiff natural ground or scarified and recompacted

before the placement of fills. New fills should be keyed into the stiff natural ground.

6. Subdrains should be placed in a herringbone pattern along the bottom and sides of natural drainageways or dips before the placement of fills. The locations of subdrains should be determined in the field after clearing and grubbing.

7. Fills should be constructed in approximately level layers starting at the lower end and working upward. Where fills are made on sloping areas steeper than about 5 horizontal to 1 vertical, the ground at the toe of the fill should be benched to a generally level condition. As the fill is brought up, it should be keyed continually into the stiff natural ground by cutting steps into the slopes and compacting the fill into these steps.

8. Fills should be laid in 6-in. compacted layers to 90% of the maximum density determined by the AASHO T-180-57 test method.

Slopes

In general, cut and fill slopes of 2 horizontal to 1 vertical or flatter should be used. The surface of fill slopes should be compacted by cat-tracking or with a sheepsfoot roller.

Slope adjustments or other precautions may be necessary if soft spots, seepage zones or expansive clay soils are encountered in localized areas.

To minimize erosion, the runoff from rainstorms should be diverted by berms or ditches away from slopes whenever practicable. Slope planting is recommended on cut and fill slopes to minimize erosion.

Roadways

In general, a rough estimate of the roadway pavement thickness for light automobile traffic is as follows:

1. Wearing course - 2-in. asphaltic concrete.
2. Base course - 6-in. base course over a prepared subgrade.

If localized clay pockets are encountered at subgrade level, these pockets should be excavated to a depth of 18 in. and replaced with select material, compacted in thin lifts.

The subgrade should be compacted and shaped to drain. To avoid the ponding of water and softening of the subgrade at low points, weep holes should be placed at subgrade level thru the walls of the catch basins which are placed in these low areas.

Existing Cesspools

Cesspools possibly may be encountered during the site preparation work. When encountered, they should be flagged and located on the plans. Sludge should be removed and replaced with fairly well-graded granular material. The material should be placed in thin layers and rammed into place or compacted with vibratory equipment.

Utilities

Utilities should be placed after the fills are constructed. Utility lines should be designed with flexible joints.

Unforeseen Conditions

Unforeseen or undetected conditions such as soft spots, seepage water, expansive soil pockets or abandoned utilities may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.

BORING LOGS

The stratification lines shown on each of the boring logs represent the approximate boundary between soil types and the transition may be gradual.

Symbols

Symbols used generally are in accordance with the Unified Soil Classification System.

Where a parenthesis "(MH)" is used, the soil sample was classified by visual observation of the sample recovered.

Where no parenthesis "MH" is used, the soil sample was classified from either the Atterberg limit or sieve analysis test results.

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PAIWA STREET EXTENSION
LOCATION: Waipahu, Oahu, Hawaii
Tax Map Key: 9-4-02; Por. 3 & 4

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" SS. 2" STANDARD SPLIT SPOON
2" S. 2" O.D. THIN WALL TUBE

BORING NO. 1 Sheet No. ___ of ___
Driller: W. LUM ASSOC., INC. Date: JAN. 10, 1972
Field Party: KAKU, RADOVICH
Type of Boring: AUGER (ACKER ACE) Diam.: 4"
Elev.: 120' ± * Datum: —
Drill Bit: T.C. DRAG
Water Level: NOT NOTICED
Time: —
Date: 1-10-72

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/.5'
	ELEV. = 120' ± *	0									
ML	MEDIUM REDDISH BROWN CLAYEY SILT		2"S	1-A	35	41 32	49	—	—		4/.5, 6/.5
(MH)	MEDIUM DARK BROWN SILTY CLAY	5	2"S	1-B	—	30	—	—	—		3/.5, 5/.5'
		10	2"SS	1-C	ROCK FRAGMENTS						30/.1'
	GRAY LAVA FORMATION W/ VESICLES										
		15	2"SS	1-D	ROCK FRAGMENTS						99/.1' HAMMER BOUNCES
	END OF BORING @ 15.1'										
		20									

*ELEVATION ESTIMATED FROM PRELIM. PLAN DATED AUG. 6, 1971

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT PAIWA STREET EXTENSION

LOCATION Waipahu, Oahu, Hawaii

Tax Map Key: 9-4-02: Por. 3 & 4

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2"SS - 2" STANDARD SPLIT SPOON
2"S - 2" O.D. THIN WALL TUBE

BORING NO. 2 Sheet No. ____ of ____

Driller W.LUM ASSOC., INC. Date JAN. 10, 1972

Field Party KAKU, RADOVICH

Type of Boring ACKER ACB Diam. 4"

Elev. 108'± * Datum —

Drill Bit T.C. DRAG

Water Level					
NOT NOTICED					
Time	—				
Date	1-10-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/.5'
	ELEV. = 108'± *	0									
	BROWN, SILTY-CLAY W/SAND, GRAVEL & CORAL										
	REDDISH-BROWN SILTY-CLAY		2"S	2-A	—	27	—	20,000	—		41.5', 51.5'
(ML)	MEDIUM, REDDISH BROWN CLAYEY SILT W/ TRACES OF SAND	5	2"S	2-B	—	27	—	11,500	—		41.5', 51.5'
(MH)	MEDIUM, BROWN CLAYEY SILT										
(MH)	MEDIUM, REDDISH BROWN CLAYEY SILT	10	2"SS	2-C	—	36	—	—	—		
	DENSE MOTTLE BROWN & GREY SILTY SAND & DECOMPOSED ROCK	15	2"SS	2-D	—	30	—	—	—		40/3" HAMMER BOUNCES
	END OF BORING @ 15.3'										

* ELEVATION ESTIMATED FROM PRELIM. PLAN DATED AUG. 6, 1971

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Boring Log

SOUNDING NO. 3 Sheet No. ____ of ____

PROJECT PAIWA STREET EXTENSION

LOCATION Waipahu, Oahu, Hawaii

Tax Map Key: 9-4-02: Por. 3 & 4

Driller W. LUM ASSOC., INC. Date JAN. 11, 1972

Field Party KAKU, RADOVICH

Type of Boring CONTINUOUS PENETRATION Diam. 2"

Elev. 69'± * Datum —

Drill Bit ____

HAMMER:

Weight 10# SLEDGE HAMMER

Drop ____

SAMPLER: 2" DIA. BLUNT POINT

	Water Level				
	Time				
	Date				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: ~~Standard~~ CONTINUOUS Penetration Test 10# SLEDGE HAMMER N (Blows per foot) 0 10 20 30 40
	ELEV. = 69'±*	0								PUSH / 1.0'
	END OF PENETRATION @ 2.5'	5								

*ELEVATION ESTIMATED FROM PRELIM. PLAN DATED AUG. 6, 1971

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PAIWA STREET EXTENSION
LOCATION: Waipahu, Oahu, Hawaii
Tax Map Key: 9-4-02: Por. 3 & 4

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"S - 2"O.D. THIN WALL TUBE
2"SS - 2" STANDARD SPLIT SPOON

BORING NO. 4 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date JAN. 11, 1972
Field Party KAKU, RADOVICH
Type of Boring ACKER ACE Diam. 4"
Elev. 66'± * Datum —
Drill Bit T.C. DRAG
Water Level NOT NOTICED
Time —
Date 1-11-72

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2"O.D. THIN WALL TUBE SAMPLE BLOWS/.5'
	ELEV. = 66'± * A.C. GRAVEL, SAND, CORAL & BROWN SILTY-CLAY	0									
ML	SOFT BROWN CLAYEY SILT		2"S	4-A	30	37	49	—	—		3/.5', 3/.5'
CH	MEDIUM DARK GRAY & BROWN CLAY	5	2"SS	4-B	26	32	67	—	—		
CH	MEDIUM, BROWN CLAY	10	2"S	4-C	28	29	58	6,330	—		6/.5', 10/.5'
(MH)	STIFF, GRAY & BROWN SILTY CLAY	15	2"SS	4-D	—	54	—	—	—		40/
	END OF BORING @ 16.5'	20									

* ELEVATION ESTIMATED FROM PRELIM. PLAN DATED AUG. 6, 1971

PAIWA STREET

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PAIWA STREET EXTENSION

LOCATION: Waipahu, Oahu, Hawaii

Tax Map Key: 9-4-02: Por. 3 & 4

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 5 Sheet No. ____ of ____

Driller: W. LUM ASSOC., INC. Date: FEB. 15, 1972

Field Party: MAESHIRO, RADOVICH, COLLURA

Type of Boring: AUGER (ACKER ACE) Diam.: 4"

Elev.: ____ Datum: —

Drill Bit: T.C. DRAG

Water Level	NOT NOTICED				
Time	—				
Date	2-15-72				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	0.5' COBBLES, SAND & CLAYEY SILT	0								
(MH)	STIFF, RED - BROWN CLAYEY SILT W/ TRACES OF SAND			5-A	—	24 28	—	—	—	
(MH)	STIFF, MOTTLED BROWN SILTY CLAY	5								
ML	MEDIUM, MOTTLED BROWN CLAYEY SILT			5-B	30	32	48	—	—	
(MH)	SOFT TO MEDIUM MOTTLED BROWN SILTY CLAY	10		5-C	—	45	—	—	—	
MH	MEDIUM, MOTTLED GRAY-BROWN SILTY CLAY	15		5-D	37	63	79	—	—	
	END OF BORING @ 21.5'	20		5-E	—	60	—	—	—	

PAIWA STREET EXTENSION

TABLE I A - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	1	1	4	4
SAMPLE NO.		A		A
DEPTH BELOW SURFACE	SURFACE	1'-2'	SURFACE	1'-2'
DESCRIPTION	REDDISH-BROWN CLAYEY SILT	REDDISH-BROWN CLAYEY SILT	BROWN SANDY SILT W/CORAL & GRAVEL	BROWN CLAYEY SILT
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"			100	
1/2"			100	
#4			96.2	
#10			93.1	
#20			89.4	
#40			86.0	
#100			75.7	
#200			69.0	
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	NATURAL
Liquid Limit	45	49	45	49
Plastic Limit	33	35	28	30
Plasticity Index	12	14	17	19
Dilatancy	MED.-QUICK	QUICK	MEDIUM	QUICK
Toughness	SLIGHT-MED.	SLIGHT	MEDIUM	MEDIUM
Dry Strength	SLIGHT-MED.	SLIGHT	SLIGHT-MED.	SLIGHT-MED.
UNIFIED SOIL CLASSIFICATION	ML	ML	ML	ML
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %	26.8		24.1	
Molding Dry Density, P.C.F.	100.2		102.9	
Swell upon saturation, %	0.2		0.2	
CBR at 0.1" Penetration	27.5		12.0	
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 3-23-72 By BT

PAIWA STREET EXTENSION

TABLE I B - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	4	4	5	5
SAMPLE NO.	B	C	B	D
DEPTH BELOW SURFACE	5'-6.5'	10'-11'	5'-6.5'	15'-16.5'
DESCRIPTION	DARK GRAY & BROWN CLAY	BROWN CLAY	MOTTLED BROWN CLAYEY SILT	MOTTLED GRAY-BROWN SILTY CLAY
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"				
1/2"				
#4				
#10				
#20				
#40				
#100				
#200				
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	NATURAL
Liquid Limit	67	58	48	79
Plastic Limit	26	28	30	37
Plasticity Index	41	30	18	42
Dilatancy	NONE	NONE	MEDIUM	QUICK
Toughness	MED.-HIGH	MED.-HIGH	MED.-HIGH	MED.-HIGH
Dry Strength	HIGH	HIGH	SLIGHT-MED.	MED.-HIGH
UNIFIED SOIL CLASSIFICATION	CH	CH	ML	MH
APPARENT SPECIFIC GRAVITY				
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %				
Molding Dry Density, P.C.F.				
Swell upon saturation, %				
CBR at 0.1" Penetration				
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)				
Dry to Wet or Wet to Dry				
Max. Dry Density (P.C.F.)				
Optimum Moisture (%)				

REMARKS:

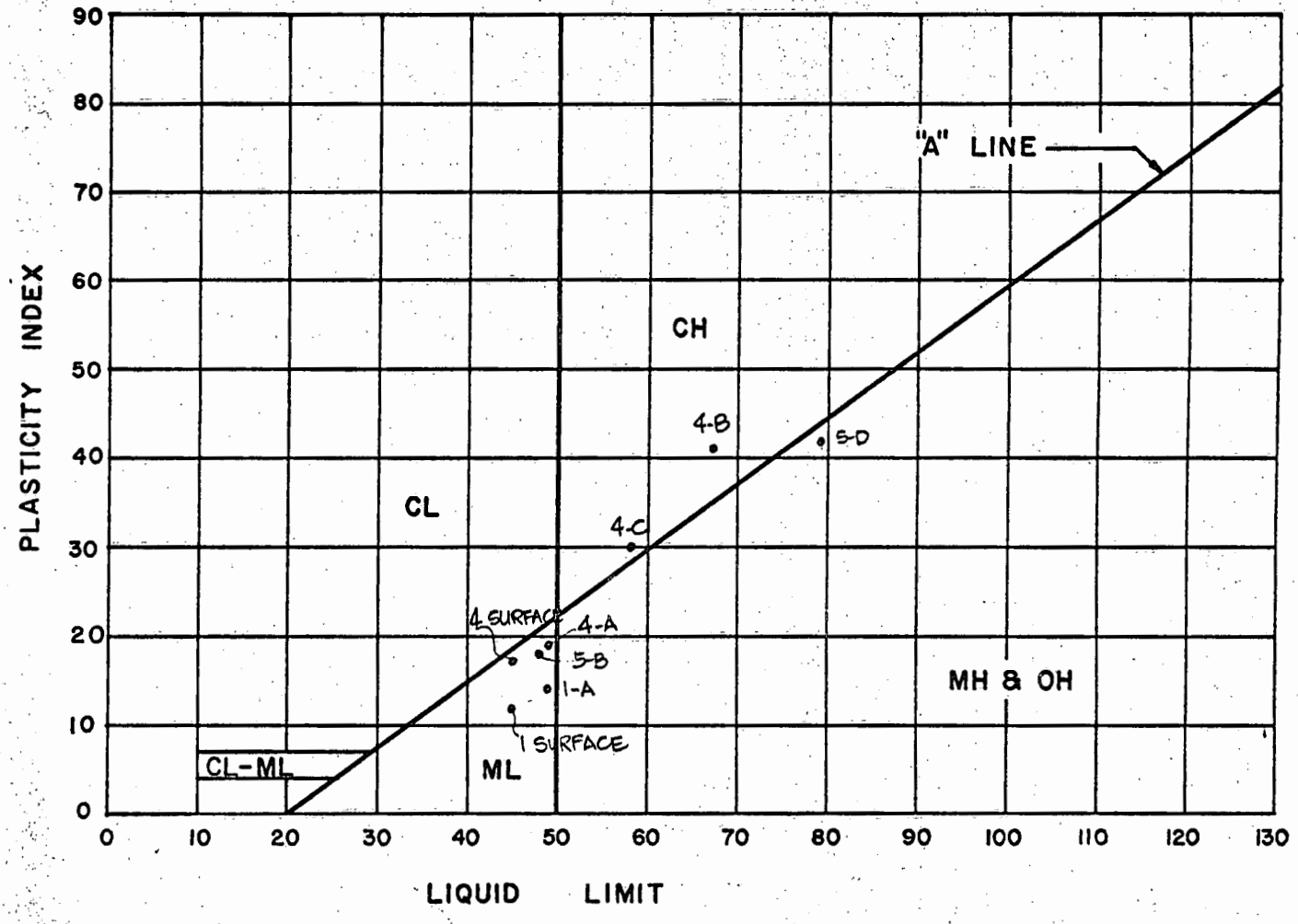
WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 3-23-72 By BT.

PLASTICITY CHART

PROJECT: PAIWA STREET EXTENSION

LOCATION: WAIPAHU, OAHU, HAWAII



DATE 3-23-72 BY BT

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

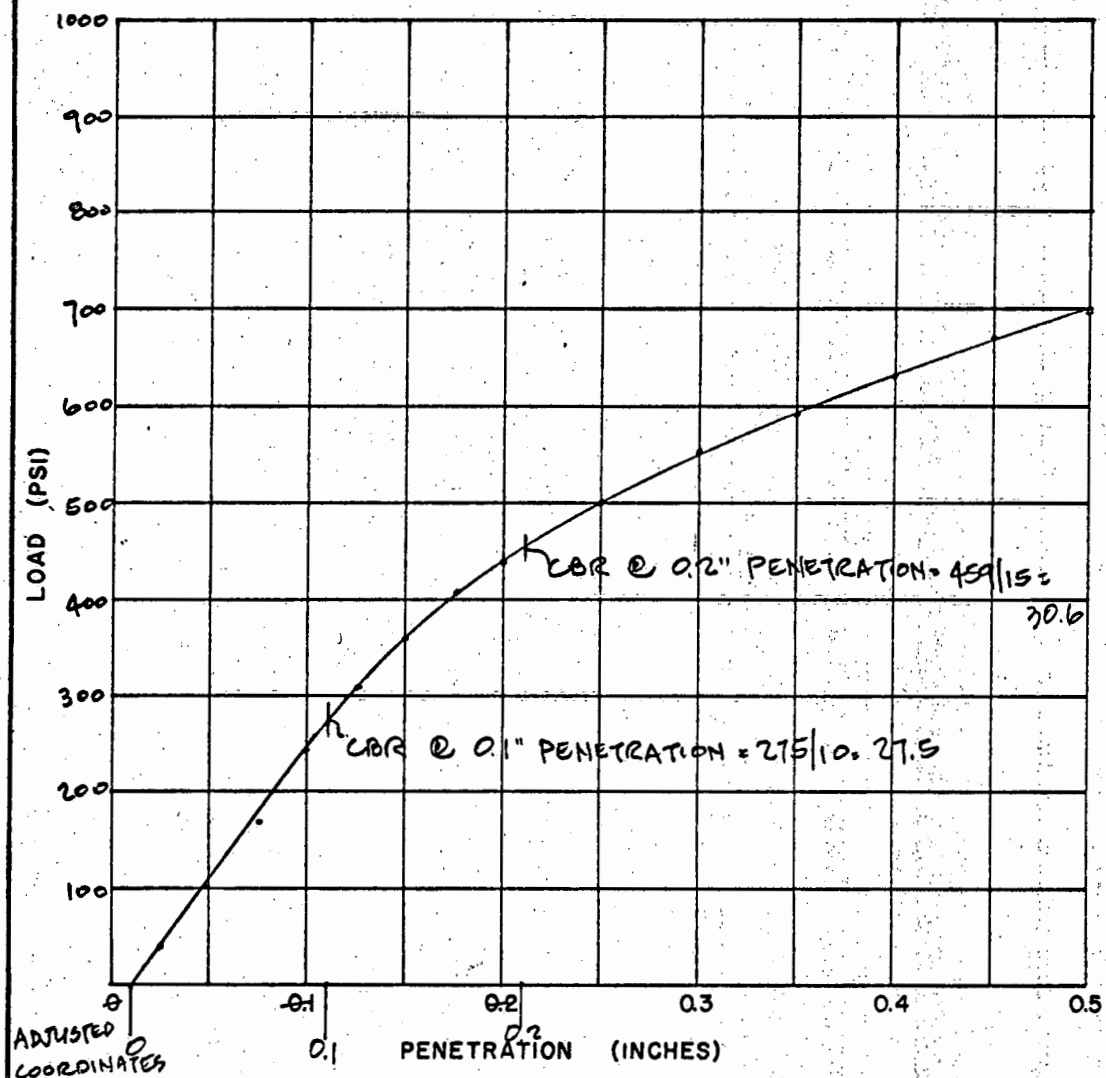
CBR TEST

PROJECT: PAIWA STREET EXTENSION

LOCATION: WAIPAHU, OAHU, HAWAII

SAMPLE NO: 1 SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN CLAYEY SILT



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS)	LOAD (PSI)
0.025	120	40
0.050	305	102
0.075	520	173
0.100	725	242
0.125	930	310
0.150	1080	360
0.175	1220	407
0.200	1320	440
0.250	1500	500
0.300	1650	550
0.350	1770	590
0.400	1900	633
0.450	2000	667
0.500	2090	697

AGGREGATE ¼" MINUS

HAMMER WEIGHT 10LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 26.8

MOLDING DRY DENSITY, P.C.F. 100.2

CBR @ 0.1" PENETRATION 27.5

DAYS SOAKED 4

DATE 1-21-72 BY MO

DATE 1-26-72 BY SK

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

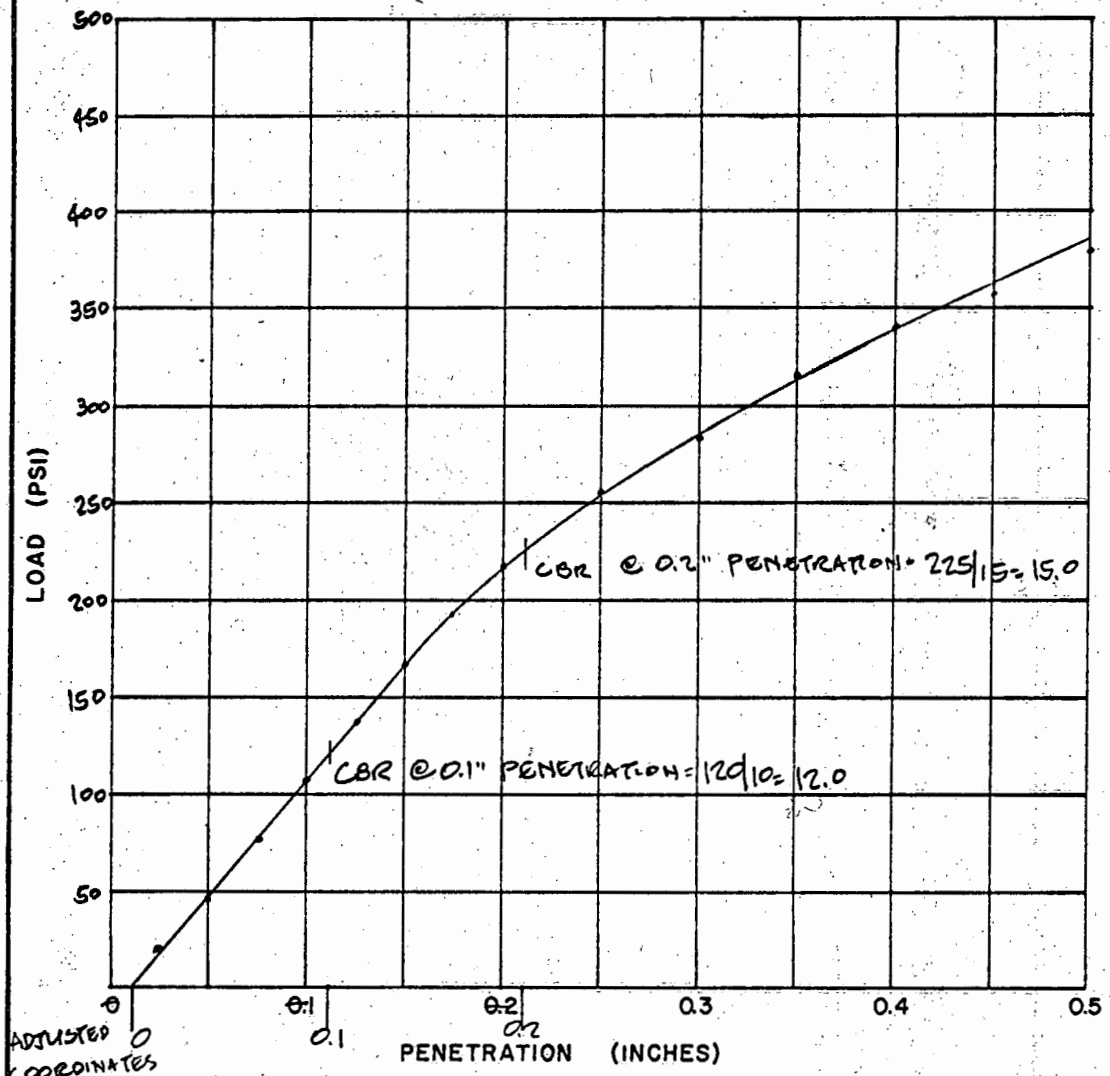
CBR TEST

PROJECT: PAIWA STREET EXTENSION

LOCATION: WAIPAHU, OAHU, HAWAII

SAMPLE NO: 4 SURFACE

SAMPLE DESCRIPTION: BROWN SANDY SILT W/CORAL & GRAVEL



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	60	20
0.050	140	47
0.075	230	77
0.100	320	107
0.125	415	138
0.150	500	167
0.175	580	193
0.200	655	218
0.250	765	255
0.300	850	283
0.350	950	317
0.400	1020	340
0.450	1075	358
0.500	1140	380

AGGREGATE ¼" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 24.1

MOLDING DRY DENSITY, P.C.F. 102.9

CBR @ 0.1" PENETRATION 12.0

DAYS SOAKED 4

DATE 1-21-72 BY RG

DATE 1-26-72 BY SK

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

10-470

LOGS OF BORINGS

FROM

WAIPAHU ESTATES UNIT 3-2

(DATED OCTOBER 11, 1971)

PROPOSED HAUL CANE ROAD IN WAIPAHU

FROM INTERSTATE H-1 TO AUALII STREET

(DATED DECEMBER 29, 1971)

PROPOSED OVERPASS STRUCTURE

OVER HAUL CANE ROAD IN WAIPAHU

(DATED MARCH 2, 1972)

WAIPAHU ESTATES 3-2

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIPAHU ESTATES UNIT 3-2
LOCATION: Waipio, Ewa, Oahu, Hawaii
Tax Map Key: 9-4-02: Por. 7

HAMMER: Weight 140# Drop 30"
SAMPLER: 2" SS - 2" STANDARD SPLIT SPOON
2" S. 2" O.D. THIN WALL TUBE

BORING NO. 1 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date AUG. 30, 1971
Field Party MAESHIRO, MEYER
Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"
Elev. 131'± * Datum —
Drill Bit FINGER TYPE

Water Level				
Time	—			
Date	8-30-71			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 131'± *	0								
(ML)	MEDIUM TO STIFF REDDISH BROWN CLAYEY SILT		2"S	1-A	120	28 28	94	–	1700 1900	3/.5' 9/.5'
		5	2"S	1-B	117	27	93	13000+	–	14/.5' 15/.5'
(MH)	STIFF, REDDISH BROWN CLAYEY SILT									
		10	2"SS	1-C	–	30	–	–	–	
(MH)	MEDIUM TO STIFF REDDISH BROWN & GRAY SILTY CLAY W/ DECOMPOSED ROCK	15	2"SS	1-D	–	32	–	–	–	
	END OF BORING @ 16.5'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WAIPAHU ESTATES UNIT 3-2

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: WAIPAHU ESTATES UNIT 3-2
LOCATION: Waipio, Ewa, Oahu, Hawaii
Tax Map Key: 9-4-02: Por. 7

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"SS - 2" STANDARD SPLIT SPOON; 2"S - 2" O.D. THIN WALL TUBE

BORING NO. 6 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date AUG. 26, 1971
Field Party MEYER, KAIKU, TSUKAZAKI
Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"
Elev. 126'± * Datum —
Drill Bit T.C. DRAG

Water Level				
Time	—			
Date	8-26-71			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test N (Blows per foot) 0 10 20 30 40	PENETRATION DATA: 2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5'
	ELEV. = 126'± *	0									
(ML-CL)	SOFT, REDDISH BROWN SILTY CLAY W/ROOTS		2"S	G-A	111	30	86	1720	500 800		1/.5' 1/.5'
(MH)	STIFF, BROWN SILTY CLAY W/TRACES OF DECOMPOSED ROCK	5	2"SS	G-B	—	31	—	—	—		
(MH)	SOFT, MOTTLED BROWN CLAYEY SILT W/ DECOMPOSED ROCK	10	2"S	G-C	105	48	64	2080	550 900		1/.5' 2/.5'
	GRAY, LAVA (PUKA PUKA) ROCK W/TRACES OF DECOMPOSED ROCK.	15	2"SS	G-D	—	18	—	—	—		45/.5'
	END OF BORING @ 14'										

* ELEVATION ESTIMATED FROM CONTOUR PLAN

CANE HAUL RO

WALTER LUM ASSOCIATES, INC.

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: PROPOSED HAUL CANE ROAD IN WAIPAHU

LOCATION: From Interstate H-1 to Aualii St. Waikele, Ewa, Oahu, Hawaii

HAMMER: Weight 140# Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 1 Sheet No. ____ of ____

Driller W. LUM ASSOC., INC. Date OCT. 15, 1971

Field Party MAKAULA ASATO, COLLURA

Type of Boring AUGER (MOBILE B-40) Diam. 6" (HOLLOW STEM)

Elev. 119'±* Datum —

Drill Bit T.C. DRAG

Water Level NOT NOTICED

Time 1:00 PM

Date 10-15-71

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 119'±*	0								
MH	STIFF, REDDISH BROWN CLAYEY SILT	5		1-A	-	32	-	-	-	
				1-B	-	31	-	-	-	
		10		1-C	30	28	53	-	-	47
		15		1-D	-	42	-	-	-	33/4" HAMMER BOUNCES
	GRAY BROWN DECOMPOSED ROCK	20		1-E	-	30	-	-	-	33/3"
		25		1-F	-	35	-	-	-	40/5"
		30		1-G	-	22	-	-	-	40/5"
	END OF BORING @ 30.5'									

* ELEVATION ESTIMATED FROM PROFILE DATED AUG. 10, 1971

WALTER LUM ASSOCIATES, INC. 3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

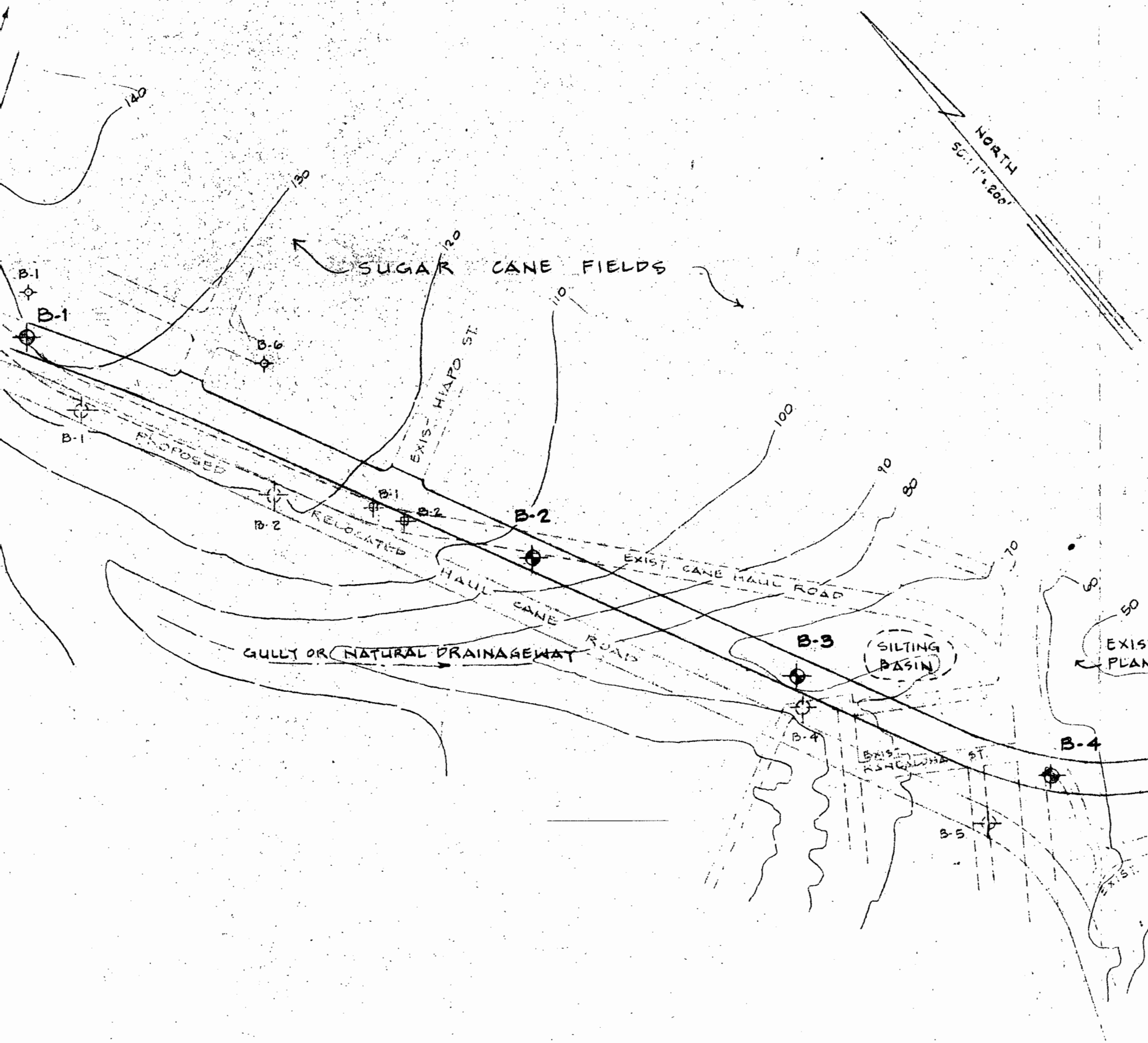
PROJECT: PROPOSED HAUL CANE ROAD IN WAIPAHU
LOCATION: From Interstate H-1 to Aualii St. Waikele, Ewa, Oahu, Hawaii
HAMMER: Weight 140# Drop 30"
SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 5 Sheet No. ____ of ____
Driller W. LUM ASSOC., INC. Date OCT. 21, 1971
Field Party MAESHIRO, KAKU, RADOVICH
Type of Boring AUGER (MOBILE B-30) Diam. 4"
Elev. 68'± * Datum —
Drill Bit T.C. DRAG
Water Level NOT NOTICED
Time —
Date 10-21-71

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Plastic Limit	Water Cont. %	Liquid Limit	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	Standard Penetration Test N (Blows per foot) 0 10 20 30 40
	ELEV. = 68'± *	0								
	BROWN, SILTY CLAY W/GRAVEL & CORAL (FILL)									
ML	MEDIUM, BROWN CLAYEY SILT W/TRACES OF ASH			5-A	-	34	-	-	-	
ML	STIFF, BROWN CLAYEY SILT W/TRACES OF DEC. ROCK	5		5-B	-	31	-	-	-	
(MH-CH)	STIFF, BROWN & GRAY SILTY CLAY W/TRACES OF DECOMPOSED ROCK	10		5-C	-	28	-	-	-	
		15		5-D	-	38	-	-	-	30/.3'
	GRAY BROWN DECOMPOSED ROCK	20		5-E	-	35	-	-	-	30/.2'
		25		5-F	-	34	-	-	-	35/.3'
	BROWN DECOMPOSED ROCK	30		5-G	-	30	-	-	-	60/.4'
	END OF BORING @ 30.4'									
	* ELEVATION ESTIMATED FROM PROFILE DATED AUG. 10, 1971									

CANE HAUL RO

STIFF PALOLO



LEGEND

- BORINGS FOR THIS REPORT
- BORINGS FOR "WAIPAHU ESTATES UNIT 3-2" (DATED OCTOBER 11, 1971)
- BORINGS FOR "PROPOSED HAUL CANE ROAD FROM INTERSTATE H-1 TO AUALII ST." (DATED DECEMBER 29, 1971)
- BORINGS FOR "PROPOSED OVERPASS STRUCTURE OVER HAUL CANE ROAD IN WAIPAHU" (DATED MARCH 2, 1972)

BORING LOCATION PLAN
PAIWA STREET EXTENSION
WAIPAHU, OAHU, HAWAII
TMK: 9-4-02: POR. 3 & 4

Dr. CR	WALTER LUM ASSOCIATES, INC.	Sheet
Date 4/72	3030 WAIALAE AVE.	
Rev.	CIVIL ENGINEERS	of
	PHONE 737-7931	